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AUTHOR(S):

HANDA, JYOJI; SHIINO, AKIHIKO; KIDOOKA, MINORU

CITATION:

HANDA, JYOJI ...[et al]. Dural Arteriovenous Malformation of the Tentorium : Report of a Case and a Review of the Literature. 日本外科学会誌 1988, 57(1): 107-114

ISSUE DATE:

1988-01-01

URL:

<http://hdl.handle.net/2433/203923>

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Dural Arteriovenous Malformation of the Tentorium. Report of a Case and a Review of the Literature

JYOJI HANDA, AKIHIKO SHIINO, and MINORU KIDOOKA

From the Department of Neurosurgery, Shiga University of Medical Science,
Seta, Ohtsu, 520-21 Shigaken, Japan
(Director: Prof. Dr. JYOJI HANDA)

Summary/Abstract

A case of a 58-year-old man with the dural arteriovenous malformation (AVM) confined to the cerebellar tentorium and presented with repeated intracranial hemorrhages is reported. A review of the literature revealed 14 similar cases of dural AVM confined to the tentorium. A drainage via the leptomeningeal veins with or without varix and a high incidence of intracranial hemorrhage were common to 15 cases including ours.

Dural arteriovenous malformation (AVM) accounts for approximately 10% of all intracranial AVMs. They most often involve the dura mater of the posterior fossa surrounding the sigmoid and transverse sinuses (7), or the dura mater of the middle fossa in the region of the cavernous sinus (8, 16). Dural AVMs restricted to the cerebellar tentorium seem to be extremely rare, and a careful review of the literature has found previous reports of only 14 cases (1, 4, 5, 6, 11, 12, 13, 14, 15), to which we wish to add one.

Report of a Case

This 58-year-old man had been healthy until May 11, 1986, when he noticed acute severe occipital headaches and nausea, which spontaneously subsided in a few days. Severe headaches recurred on May 18. A spinal tap at that time yielded the bloody cerebrospinal fluid, and cerebral angiography found an AVM. After two weeks' conservative treatment, the patient was discharged without neurologic deficits.

On September 7, 1986, however, severe headaches recurred, associated with repeated vomiting, speech disturbance and gait disturbance. He was readmitted to a hospital, and computed tomography (CT) scan found a cerebellar hematoma and triventricular hydrocephalus. A ventricular drainage was performed, and he was transferred to us on September 22, for further examination and treatment.

On admission, the patient was alert but his neck was stiff. Neurologic examination showed

Key words: AVM, Dural AVM, Intracranial hemorrhage, Varix.

索引語: 動静脈奇形, 硬膜動静脈奇形, 頭蓋内出血, 静脈瘤.

Reprint requests to: Jyoji Handa, M.D., Department of Neurosurgery, Shiga University of Medical Science, Seta, Ohtsu, 520-21 Shiga-ken, Japan.

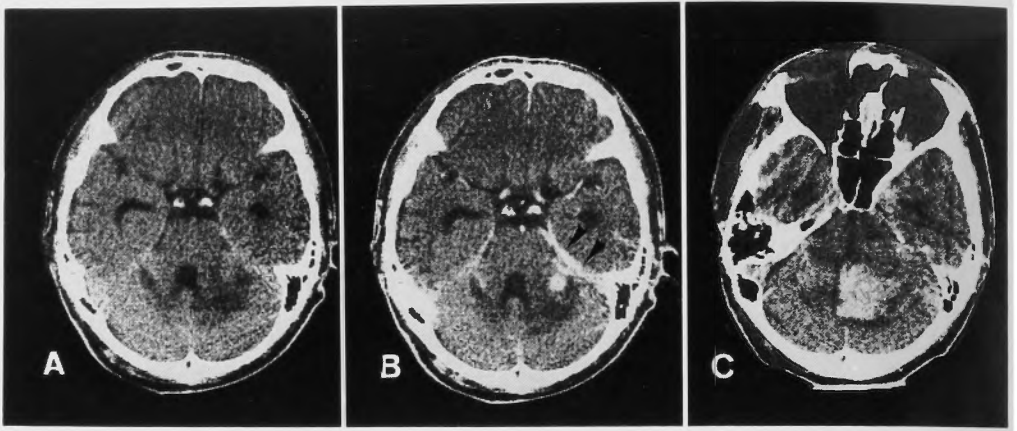


Fig. 1. (A) plain and (B) enhanced CT obtained on September 30. Low density area in the cerebellum in A corresponds to an aged hematoma and/or edema. In B, an abnormal enhancement is seen in the tentorium along the left petrous ridge (arrowheads) and in the left cerebellopontine angle region. (C) Repeat CT on October 2, showing fresh cerebellar hemorrhage.

paresis of the left Vth, VIth, VIIth, IXth and Xth cranial nerves, and limb ataxia on the left side. Repeat CT scan showed a low density focus in and around the left cerebellar peduncle. After an intravenous administration of the contrast medium, abnormal enhancement was seen in the left cerebellopontine angle region as well as in the tentorium along the left petrous ridge (Figure 1A, B).

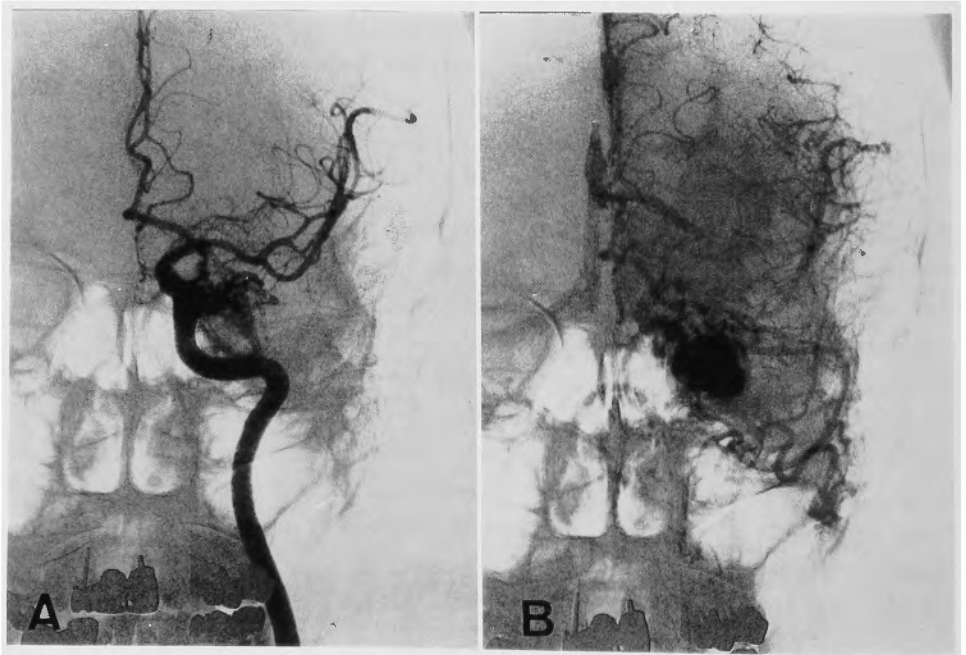


Fig. 2. Frontal projection of selective left internal carotid angiogram, (A) early and (B) late arterial phase. An AVM fed by the tentorial branch and drained via a varicose vein is opacified.

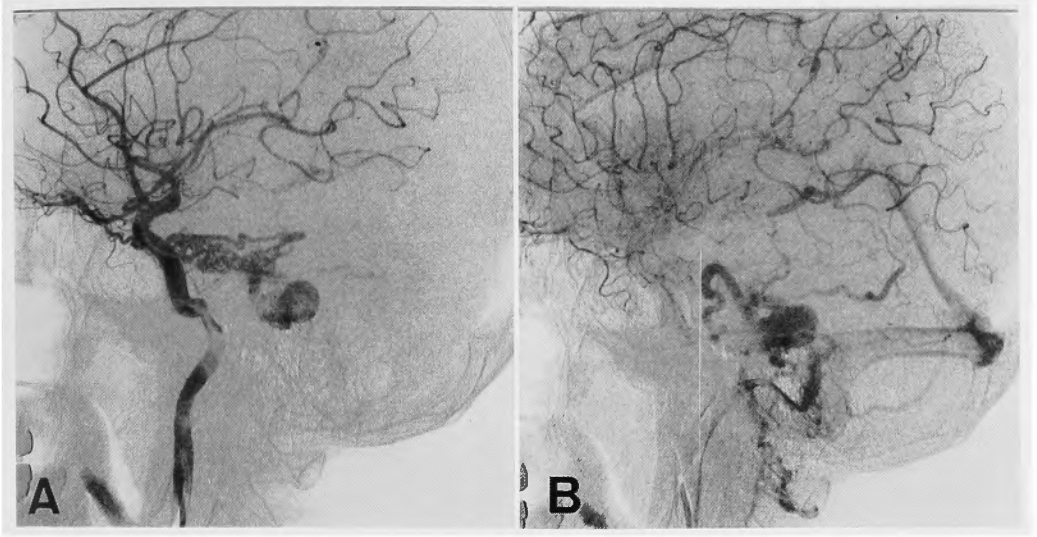


Fig. 3. Lateral projection of selective left internal carotid angiogram, (A) early and (B) late arterial phase. An AVM involving the tentorium, enlarged tentorial branch as a main feeding artery, and a varicose dilatation of the draining vein are shown.

Cerebral angiography found an AVM involving the left anteromedial part of the cerebellar tentorium. Main feeding arteries were tentorial branch of the left internal carotid artery and occipital and middle meningeal arteries of the left external carotid origin. The AVM was drained via a varicose dilatation to the petrosal and internal cerebral veins (Figures 2, 3 & 4). Selective injection of the contrast medium into the vertebral artery showed a faint opacification

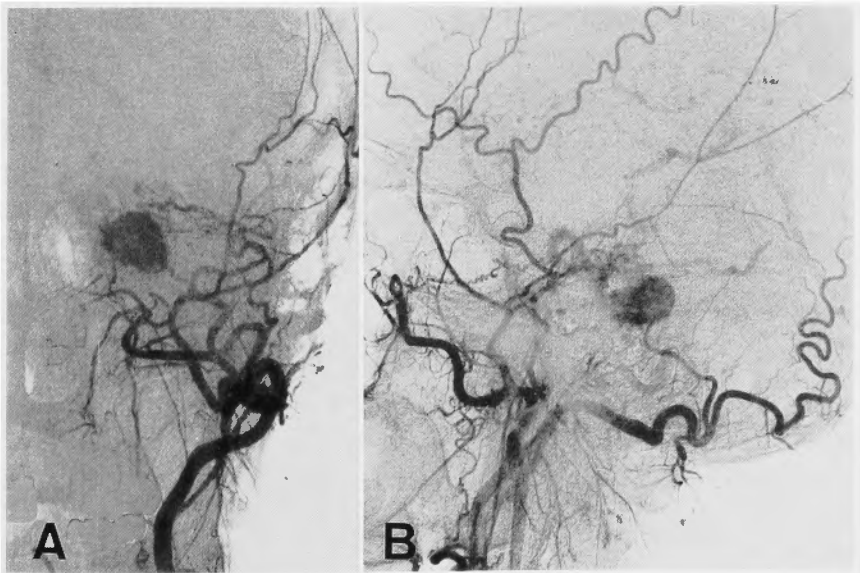


Fig. 4. (A) Frontal and (B) lateral projection of selective left external carotid angiogram. The middle meningeal artery and the occipital artery participated in the blood supply to the AVM.

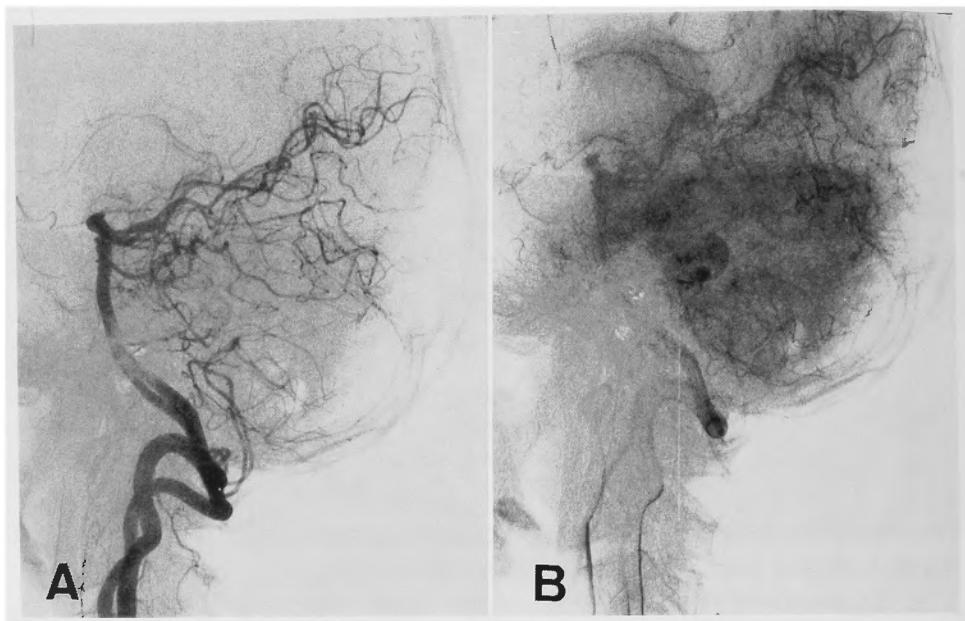


Fig. 5. Lateral projection of (A) arterial and (B) late arterial phase of vertebral angiogram, showing the varix faintly.

of the varicose dilatation, but the feeding arteries and the further draining routes could not be identified (Figure 5).

The ventricular drain was removed, but the condition of the patient remained stable until October 2, when he acutely lapsed into coma. An emergency CT scan found a large cerebellar hematoma (Figure 1C), and marked triventricular hydrocephalus. The patient underwent a ventricular drainage. He recovered consciousness within a few hours, but neurological examination showed marked worsening of limb ataxia on the left side and dysarthria.

Left temporal craniotomy was performed on October 14. Gentle retraction of the temporal lobe revealed a dural AVM involving the anteromedial portion of the tentorium near its free edge. The tentorium was incised along the superior petrosal sinus. A large dural artery, apparently representing an enlarged tentorial branch of the internal carotid artery, was encountered near the free edge. It was clipped and divided. Inspection of the cerebellopontine angle region through a hole made by tentorial incision found a large red vein leaving the dural AVM from the lower surface of the tentorium and entering the varicose vein. A triangular piece of the tentorium was resected, including the nidus of the AVM. At this point, the red vein and varix discolored and collapsed. They were coagulated and divided. A total removal of the AVM was confirmed later by repeated postoperative angiography. Four months later, the patient was transferred to an institution for the purpose of further rehabilitation.

Discussion

The dural AVM most often involves the dura mater of or near the cavernous sinus, or the

dura mater in the region of the lateral and sigmoid sinuses. The former occurs most often in elderly woman, and it may cause chemosis, conjunctival hyperemia, proptosis, ophthalmoplegia, retro-orbital pain, and occasionally diminished visual acuity. However, the symptoms are generally fewer and milder than those seen in direct carotid-cavernous sinus fistulas, and spontaneous closure or closure following diagnostic angiography has been reported.

The dural AVM of the transverse-sigmoid sinus, on the other hand, usually presents cranial bruits, tinnitus, headache, and seizures, and a subarachnoid hemorrhage occurs in 10 to 20% of cases (17). Dural AVMs in this region often accompany obstruction of one or both sigmoid sinuses. They are usually thought to be congenital, but recently it has been described that at least some of them are acquired lesions, developing after a head injury (3). Complete eradication of such lesions either by operation or by endovascular procedures is often extremely difficult.

Dural AVMs in the region of the anterior cranial fossa are infrequent, but they are unique in that [1] they are most often supplied by the ethmoidal branches of the ophthalmic artery, [2] they are drained into the dural venous sinuses not directly but via the cortical veins which are often dilated, and [3] they usually present with intracranial hemorrhage (9, 10).

Dural AVMs confined to the cerebellar tentorium such as seen in this patient seem to be very rare. After a careful review of the literature, we could collect reports of only 14 previous cases (1, 4, 5, 6, 11, 12, 13, 14, 15). Pertinent clinical data of a total of 15 patients including the present case are summarized in the table.

Ten patients were the male and five were the female, ranging in age from 33 to 72 years, with a mean of 54. Clinically, patients with this group of dural AVMs showed a rather homogeneous presentation that is quite similar to that with dural AVMs in the base of the anterior fossa but differs significantly from lesions draining directly into the lateral and sigmoid sinuses. Fourteen out of 15 patients presented with intracranial hemorrhage. In 9 patients hemorrhage involved mainly the subarachnoid space whereas in 5 patients intracerebral hematoma developed.

Multiple feeding arteries were identified in all patients except one (4). The tentorial artery or the meningohypophyseal trunk fed the AVM in 10 patients, the middle meningeal artery in 8 patients, and the occipital artery and the posterior meningeal branch in 6 patients each. The ascending pharyngeal artery, the stylomastoid artery, the accessory meningeal artery and the tentorial branch of the posterior cerebral artery were also found to have fed the tentorial AVM in a small number of cases. Reviewing the records of 15 cases in detail, however, it seems to be especially noted that the mode of drainage was directly into the dural venous sinuses in only 1 case (4), and through the cortical veins (type 3 drainage route of the classification by Castaigne (2)) in all other 14 patients. In 7 of those 14 patients, in addition, the draining cortical vein showed a varicose dilatation as often seen in lesions in the anterior cranial fossa. Presence of such long course of leptomeningeal draining veins with or without varicose dilatation before ending finally in the dural venous sinuses is highly characteristic in, and common to, dural AVMs of the anterior cranial fossa as well as tentorial dural AVMs, and it is considered to be the cause of a high incidence of intracranial hemorrhage in both. Also in the present patients, the operation found that the source of hemorrhage was the varicose draining vein in the

Table 1. Dural AVM confined to the tentorium.

| # | AUTHOR | YEAR | AGE/ SEX | PRESEN- TATION | FEEDERS | DRAINER | VARIX | TREATMENT | RESULT |
|----|------------|------|-------------|-------------------|--------------------------------|---------------------------------|-------|--|------------------------------------|
| 1 | Laine | 1963 | 33/M | SAH | MMA, TA, PMA | via cortical vein | + | Feeder ligation | |
| 2 | Debrun | 1972 | 47/F | // | TA | direct to cavernous sinus | | None | |
| 3 | Aminoff | 1973 | 62/F | // | TA, MMA | via cortical vein | + | Excision | |
| 4 | // | // | 51/M | // | TA, MMA, OA, PMA | // | | // | |
| 5 | Kosnik | 1974 | 52/M | // | TA, OA | // | | Multiple op., finally excision | |
| 6 | Miyasaka | 1980 | 51/M | No bleeds | PMA, TB-PCA | // | | Excision | |
| 7 | Fardoun | 1981 | 54/M | ICH | OA, MMA | // | + | Embol., feeder & drainer clip | Negative follow-up angiogram |
| 8 | Grisoli | 1984 | 36/M | SAH | TA, MMA | // | | Excision | // |
| 9 | // | // | 64/M | ICH | TA, OA, AsphA | // | | Drainer clip | No deficit |
| 10 | // | // | 55/F | SAH | MMA, TA, PMA | // | | // | Good |
| 11 | // | // | 68/F | ICH | AccMA, AsphA, StmA | // | + | Feeder & drainer clip | Good |
| 12 | Malik | 1984 | 72/M | SAH | OA, PMA, PAurA | // | + | Feeder ligation | Repeat bleeds |
| 13 | // | // | 48/F | ICH | TA, PMA, MMA, OA, CavICA | // | + | Embol., later excision | |
| 14 | Lasjaunias | 1986 | 52/M | SAH | MMA, TA, AsphA | // | | | |
| 15 | Handa | 1988 | 58/M | SAH/ ICH | TA, OA, MMA | // | + | Excision | Negative follow-up angiogram |

Abbreviation: M: male, F: female, SAH: subarachnoid hemorrhage, ICH: intracerebral hemorrhage, MMA: middle meningeal artery, TA: tentorial artery, or meningohypophyseal trunk, PMA: posterior meningeal artery, OA: occipital artery, TB-PCA: tentorial branch of posterior cerebral artery, AsphA: ascending pharyngeal artery, AccMA: accessory meningeal artery, PAurA: posterior auricular artery, CavICA: cavernous internal carotid artery, op.: operations, embol: embolization.

cerebellopontine angle.

With dural AVMs in general, distal ligation of the feeding arteries seems most often to result in failure because it does not reduce the blood flow to the nidus sufficiently enough to produce a total obstruction. Recently, embolization or occlusion with a detachable balloon of feeders has been proposed by many authors. With tentorial dural AVMs, however, the tentorial artery or the meningohypophyseal trunk most often is the principal feeding artery. It is not necessarily easy to occlude it by such methods, and the risk of an inadvertent occlusion of the cerebral artery can not be excluded. In sharp contrast to the dural AVMs of the transverse-

sigmoid sinuses, however, the direct surgical approach to the nidus with interruption of all the afferent vessels and a direct removal of the nidus together with a piece of the tentorium is a relatively easy task with dural AVMs confined to the cerebellar tentorium, and this would appear to be the treatment of choice with this rare but potentially highly dangerous condition.

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和文抄録

小脳天幕に局限した硬膜動静脈奇形

滋賀医科大学脳神経外科

半田 譲二，椎野 顕彦，木戸岡 実

58才男で頭蓋内出血を繰り返した小脳天幕の硬膜動静脈奇形の例を報告した。この部の硬膜動静脈奇形はまれで、14例の報告をみるにすぎない。しかし、計15例中14例は頭蓋内出血を呈し、又、血管撮影上、流出静脈は硬膜静脈洞に注ぐ前に長い距離に亘って脳表

面を走行し、しかもしばしば静脈瘤様拡大を伴ない、これが頭蓋内出血を多発する原因と思われる。横・S状静脈洞に注ぐ通常の後頭蓋窩硬膜動静脈奇形と異なり、天幕の1部を含めた全剥出が最善の処置である。